INSTRUCTION MANUAL

# SUPERCAL

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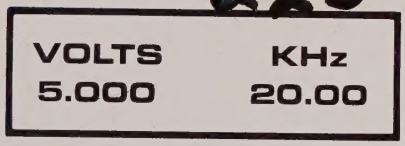


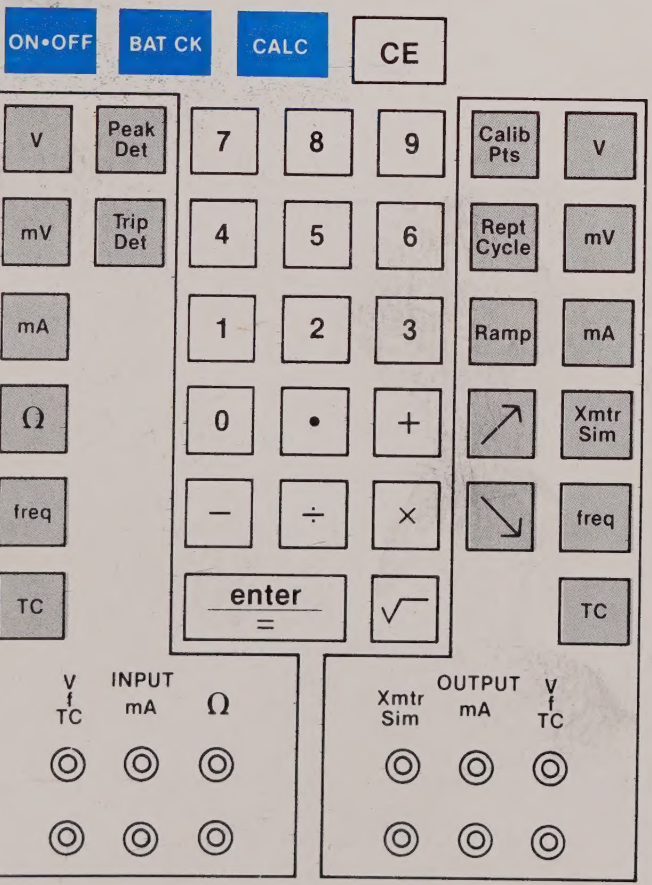

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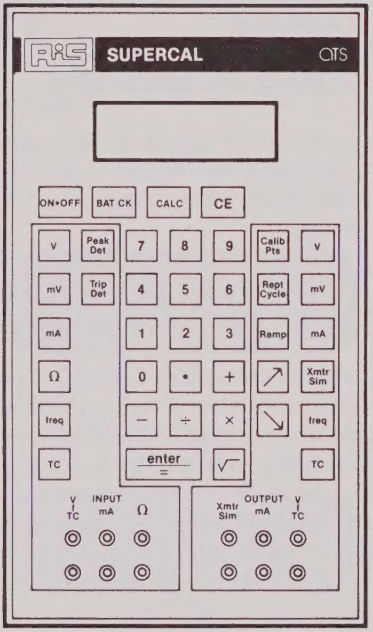
## GENERAL INFORMATION

The SUPERCAL faceplate consists of five functional blocks for interfacing the operator with the unit. One block consists of a two line, 16 character per line, liquid crystal display for prompting and measurement information; the second block consists of the grey input entry and data manipulation keys for entering values to be processed by the SUPERCAL; the third and forth blocks consist of input and output function keys which allow the operator to call up functions as needed; and the final block, separated into two groups, and located at the bottom of the faceplate, are the input and output terminals.




### Battery Charging

Units are sent to the customer with the internal batteries in an uncharged state. Therefore, before using the SUPERCAL as a portable unit, it is necessary to charge the batteries with the battery charger for a minimum of 14 to 16 hours for dependable operation. Refer to the following chart for an approximate guide to battery life battery operation time at various dischage rates.

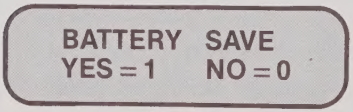
| Current Output | Battery Operation Time |
|---|---|
| 0 mA | 4½-5 hours |
| 20 mA | 4-4½ hours |

## Operation

### POWER ON SEQUENCE

Turn the SUPERCAL on by pressing the ON•OFF button. Random characters will appear in the LCD display during the 6 second initialization stage. When the initialization stage is complete, the message

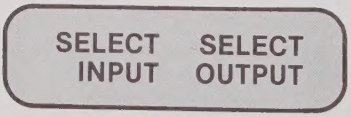
will appear for approximately 4 seconds while the calibrator performs self calibration. This function eliminates the need for any further adjustments to the unit by the operator. Upon completion of self calibration, the message




will appear. If [1] is pressed the SUPERCAL will automatically turn itself off when no keys are pressed in any 20 minute interval. If [0] is pressed the SUPERCAL will remain on indefinitely.

If neither key is pressed, the SUPERCAL will turn off after 20 minutes.

The next message




indicates the SUPERCAL is ready for operation.

Note: The intrument recalibrates itself every six minutes without interruption of operation.

## TO CHECK BATTERY VOLTAGE

Press **BAT CK** . The Display will read

| | |
|---|---|
| **BATT V** | **SELECT** |
| **+X.XXX** | **OUTPUT** |

Where + X.XXX should be a voltage between 4.5 and 6.2Vdc.

## LOW BATTERY

When operating, the SUPERCAL continuously monitors its battery voltage for a "low battery" condition. Once the unit senses a battery voltage that does not support the accuracy of the unit, the SUPERCAL interrupts the normal display with the message, "Low Battery", every two seconds. Once this condition is observed, discontinue the portable use of the SUPERCAL until the batteries have been recharged.

Should the customer experience the inability to charge the batteries to an acceptable voltage level, it may be necessary to install a new battery pack in the unit due to battery failure. For a description of this procedure, refer to the section labeled "Battery Replacement".

## OPERATING SUPERCAL WITHOUT BATTERIES

While SuperCal will operate from the battery charger with no battery pack installed, the accuracy of the unit will be severely impaired. It is therefore recommended that the customer order a spare battery pack to eliminate unnecessary "down-time" due to battery failure.

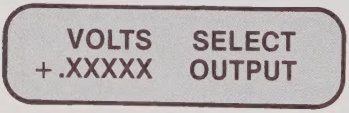
To order a spare battery pack or battery charger write or call Rochester Instrument Systems at the appropriate location described on the Procedures for Factory Repair and Return Sheet located at the end of this manual.

## INPUT SELECTION

The following chart shows which SUPERCAL function may be used with each input selection:

| | | INPUT | | | | | |
|---|---|---|---|---|---|---|---|
| FUNC | | VOLTS | MILLIVOLTS | MILLIAMPS | OHMS | Freq. | T/C |
| | Peak | X | X | X | X | | X |
| | Trip | X | X | X | X | X | X |

Pressing one of the input selection keys instructs the SUPERCAL to measure the function selected. For example, to measure voltage press V. The SUPERCAL will display the voltage on the left half of the display screen.
The message will read,

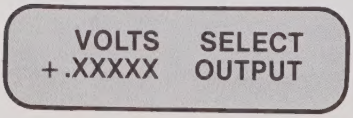



For all inputs other than millivolts and thermocouple, the SUPERCAL automatically adjusts the gain of its input stage for the range within which the input value occurs (autoranging).

### VOLTS

Press the V key.
The message will read,

| Input Range | Resolution |
|---|---|
| less than 2 Vdc | 0.1 mV |
| 2 Vdc to 10 Vdc | 1.0 mV |



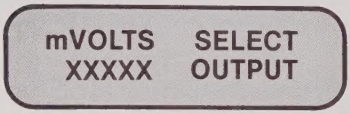

Measure the input voltage with the probes in the Voltage Input terminals.

## INPUT SELECTION (Continued)

### MILLIVOLTS

Press the **mV** key.
The message will read,

| Input Range | Resolution |
|---|---|
| 0 - 200 mV | 10 microvolts |

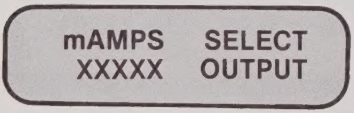



Measure the input voltage with the probes in the Voltage Input terminals.

### MILLIAMPS

Press the **mA** key.
The message will read,

| Input Range | Resolution |
|---|---|
| 0 - 200 mA | 10 microamps |

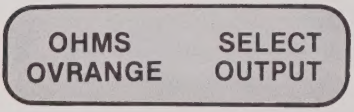



Measure the input milliamps with the probes in the Milliamp Input terminals.

### OHMS

Press the **Ω** key.
The message will read,

| Input Range | Resolution |
|---|---|
| 0 - 99.9 Ohms | .01 Ohms |
| 100 -1999.9 Ohms | 0.1 Ohms |
| 2K - 5K Ohms | 1.0 Ohms |




Measure the resistance with the probes in the Ohms Input terminals.

For precision application of the Ohms Function, short the probes together and record the Ohms offset: subtract this value from any reading.

## INPUT SELECTION (Continued)

### FREQUENCY

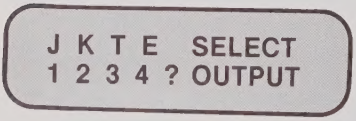
Press the **freq** key. The message will read

| Input Range | Amplitude | Resolution |
|---|---|---|
| 50 Hz to 50 KHz | 100 mV to 130 V | 0.1 Hz |

Measure the input frequency with the probes in the Frequency Input terminals.

### TC (Thermocouples)

Press the **TC** key. The message,




will appear. Press the number corresponding to the thermocouple type to be measured.

## INPUT SELECTION (Continued)

For example if [2] is pressed, the message

```
C=1 F=2  SELECT
K      ?  OUTPUT
```

Press [1] if the temperature is to be in degrees Celsius or [2] for degrees Fahrenheit. For example if [2] is pressed the message

```
K-TC°F  SELECT
+XXX.X  OUTPUT
```

will appear and temperature in degrees F will be displayed. Measure the TC's voltage with the thermocouple connected to the Thermocouple Input terminals, taking care to observe polarity.

The following ranges and resolutions are available with the Thermocouple Function.

| TC type | Temperature Range | Resolution |
|---|---|---|
| J | – 185C to 1000C | ± 0.1C |
| K | – 155C to 1370C | ± 0.1C |
| T | – 185C to 400C | ± 0.1C |
| E | – 210C to 1000C | ± 0.1C |

### NOTES

1. SUPERCAL comes equipped with cold junction compensation.

2. Thermocouple wire of the Thermocouple type selected must be used and connected to the T/C input binding posts.

3. The red lead (–) of the Thermocouple wire is to be connected to the black terminal (–) of the SUPERCAL for proper polarity.

## INPUT SELECTION (Continued)

### PEAK DETECT

Press the key corresponding to the variable to be measured followed by **Peak Det** . For example, we wish to see the maximum current in a process loop. Press **mA** then **Peak Det** . The display will read

The Λ character indicates the calibrator is in the Peak Detect mode. It will indicate the highest value measured. To exit Peak Detect mode reselect **mA** (or any other input variable). Peak Detect operates on all input variables except frequency.

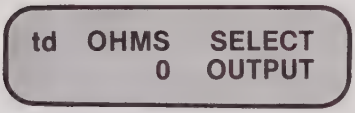
### TRIP DETECT

The Trip Detect function detects a resistance change across the Ohms Input terminals. The resistance change must exceed 10 Ohms within the specified range of 0 to 5K Ohms and no sources should be connected to the contacts.

Trip Detect is most often used to calibrate voltage or current alarms. A detailed description is provided in the section labeled, "Calibration of mV Alarms".

## INPUT SELECTION (Continued)

To use this fuction press [Ω] then [Trip Det]. The display will read




or

depending on whether the measured resistance is within the specified range or overrange.

When trip is detected the display will read

To reselect following a trip, press [Trip Det].

## OUTPUT SELECTION

The following chart shows which SUPERCAL function may be used with each output selection:

| FUNC | | OUTPUT | | | | | |
|---|---|---|---|---|---|---|---|
| | | VOLTS | MILLIVOLTS | MILLIAMPS | XMTR SIM. | Freq. | T/C |
| | Calib. Pts | X | X | X | X | | X |
| | Ramp | X | X | X | X | | X |

Pressing one of the output selection keys instructs the calibrator to generate the function selected. For example to generate voltages press **V**. The calibrator will display the actual output terminal voltage on the right half of the display screen. The message will read:

```
SELECT    VOLTS
INPUT       ?
```

### VOLTS

Press the **V** key.

The message will read:

| Output Range | Resolution |
|---|---|
| less than 2 Vdc | 0.1 mV |
| 2 Vdc to 10 Vdc | 1.0 mV |

```
SELECT    VOLTS
INPUT       ?
```

Enter the desired voltage and press **enter** / **=**. The ? will disappear and the output will go to the desired voltage level. Should the request voltage be outside the range of the calibrator, the ? will remain in the display until a proper voltage is requested.

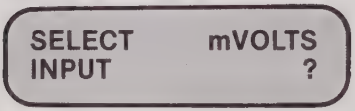
## OUTPUT SELECTION (Continued)

### MILLIVOLTS

| Output Range | Resolution |
|---|---|
| 0 - 200 mV | 10 microvolts |

Press the **mV** key.

The message will read:



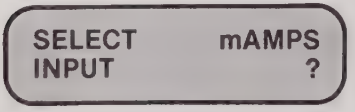

Enter the desired voltage and press **enter** / **=** . The ? will disappear and the output will go to the desired voltage level. Should a value be entered that is out of the range of the calibrator, the ? will remain in the display until a proper value is entered.

### MILLIAMPS

| Output Range | Resolution |
|---|---|
| 0 - 54.99 mA | 10 microamps |

Press the **mA** key.

The message will read:




Enter the desired current and press **enter** / **=** . The ? will disappear and the output will go to the desired current level. Should a value be entered that is out of the range of the SUPERCAL, the ? will remain in the display until a proper value is entered.

## OUTPUT SELECTION (Continued)

### FREQUENCY

Press the **freq** key.

| Output Range | Resolution |
|---|---|
| 50 Hz to 1 KHz | 0.1 Hz |
| 1 KHz to 20 KHz | 1.0 Hz |

The calibrator will request the output amplitude by indicating

```
SELECT  PP Ampl
INPUT       ?
```

Enter the desired value between .05 V and 10 V. Press **enter =** and the output will adjust to the requested value. The SUPERCAL will then request the output frequency by indicating:

```
SELECT      KHz
INPUT       ?
```

Enter the desired value between 50 Hz (entered as .05) and 20.0 KHz (entered as 20). Press **enter =** and the output will adjust to the requested value.

Note that this may take 30 to 40 seconds for frequencies above 500 Hz and greater than 40 seconds for lower frequencies. Should a value be entered that is out of the range of the calibrator, the ? will remain in the display until a proper value is entered.

To change either amplitude or frequency, press the frequency key and enter the new values.

### TC (Thermocouples)

Press the **TC** key. The SUPERCAL will request the thermocouple type by indicating:

```
SELECT  J K T E
OUTPUT  1 2 3 4
```

## OUTPUT SELECTION (Continued)

Press the appropriate number and the SUPERCAL will request temperature units. For example, if [ 2 ] is pressed, the display will read:

```
SELECT C = 1  F = 2
INPUT K          ?
```

Press the appropriate number and the calibrator requests the desired temperature. For example, if [ 2 ] is pressed for degrees Fahrenheit, the display will read:

```
SELECT   K = TC°F
INPUT            ?
```

Enter the desired temperature and press [ enter / = ]. The output will advance to the requested value.

The following ranges and resolutions are available with the Thermocouple function.

| TC type | Temperature Range | Resolution |
|---|---|---|
| J | – 185C to 1000C | ± 0.1C |
| K | – 155C to 1370C | ± 0.1C |
| T | – 185C to 400C | ± 0.1C |
| E | – 210C to 1000C | ± 0.1C |

### NOTES

1. Thermocouple wire of the Thermocouple type selected must be used and connected to the T/C output binding posts.

2. The red lead ( – ) of the Thermocouple Wire is to be connected to the black output terminal ( – ) of the SUPERCAL for proper polarity.

## OUTPUT SELECTION (Continued)

## INCREMENTAL OUTPUT FUNCTION

The Incremental Output Function allows the user to increase or decrease the output of the calibrator by approximately 1% of the present value as read in the display. For example, by pushing the when the present value of the output is 5KHz will cause the output to rise to 5.050 KHz. Had the output been 2.5 Volts instead of 5 KHz, pushing the would have caused the output to rise to 2.525 Volts. Conversely, had the been pushed when the output was 5 Volts, then the output would have dropped to 4.95 Volts. This function works with all output variables.

## TO USE CALIBRATION POINTS

(1) Select the output function desired. For example, Volts. Press [V]

(2) Press [Calib Pts] and the calibrator responds with

Enter the value required and press [enter =] . The calibrator will resolve and store this value in memory and then request the next point with

Continue entering as many calibration points as desired up to 10. When the last calibration point has been entered, points may be reviewed and verified by pressing the [↗] or [↘] arrows. Since the calibration points are stored in a stack, pressing [↘] will give the previous value entered. Wrap around takes place at the ends of the stack.

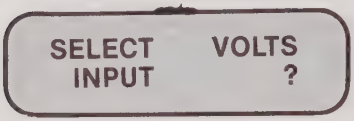
The SUPERCAL may be continuously cycled through the calibration points by pressing [Rept Cycle]. Repeat Cycle always goes to PT #1 for its first value, and then cycles sequentially for all the points entered. There is a 10-second dwell time at each step.

**NOTE**

Calibration points can be used with all output functions except frequency.

## TO USE THE RAMP FUNCTION

(1) Select the output function desired. For example, Volts. Press [V]




(2) Press [Ramp] and the calibrator responds with:

Let's say we wish to Ramp from 1 volt to 5 volts. Enter 1 volt. The calibrator will determine and store the 1 volt value. It will then request:

Enter 5 volts and the calibrator will request:

This is the time in seconds the voltage output will take to go from the Low limit to the High limit and it is also the number of voltage steps the output voltage will increment as it goes from the low to the high limit. The maximum value is 600 seconds or 600 increments. Therefore, to improve the resolution of this function i.e. approaching a straight line, the operator has two choices: increasing the time interval or decreasing the voltage interval.

1. Ramp from Low limit to High limit and hold at the High limit by pressing .
2. Ramp from High limit to Low limit and hold at the Low limit by pressing .
3. Continuously Ramp from Low limit to High limit, with a 10-second hold at maximums and minimums, by pressing

.

**NOTE**

Ramp operates for all output functions except frequency.

## TO USE THE CALCULATE FUNCTION

Press CALC the display will read

enter value and select arithmetic function to be performed: + − × ÷ or √
(Maximum allowable operand value = 9999.)

**Example**

16 × .025 enter = . The display will read:

If an input function was selected before the Calculate Function was enabled, the calibrator will continue to display the measured input value on the left side of the display.

If calculation of an input value is desired this can be done by pressing the CALC key then the enter = key. This will transfer the displayed input value over to the right side of the display where calculations can then be performed. Subsequent pressing of the enter = key after calculation will return the display to the original input value for further calculation if desired.

To exit calculate function press the CALC key again and the calibrator will resume its previous operation.

## TO USE TRANSMITTER SIMULATOR (Two-wire Simulator)

The purpose of this function is to simulate a two-wire transmitter connected in a process control loop. In order for this function to operate correctly, the process control loop must have a power source in it. Refer to the table at the end of this discussion for the loop specifications and Figure 1 for the connections to the calibrator.

Press [Xmtr Sim]. The display will read:

```
SELECT    mAMPS
INPUT       ?
```

Enter the required value; then press [enter =]. The output will advance to the requested value.

When using this function in conjunction with the Repeat Function, the prior entry automatically becomes the lower limit. Therefore, it is necessary only to enter the upper limit and transition time for the ramp function to operate.

| Loop Specifications |
| --- |
| 1. Maximum External Loop Voltage: 100VDC |
| 2. Maximum External Loop Resistance: 1150 ohms at 28V loop power supply at 4-20 mA output. |

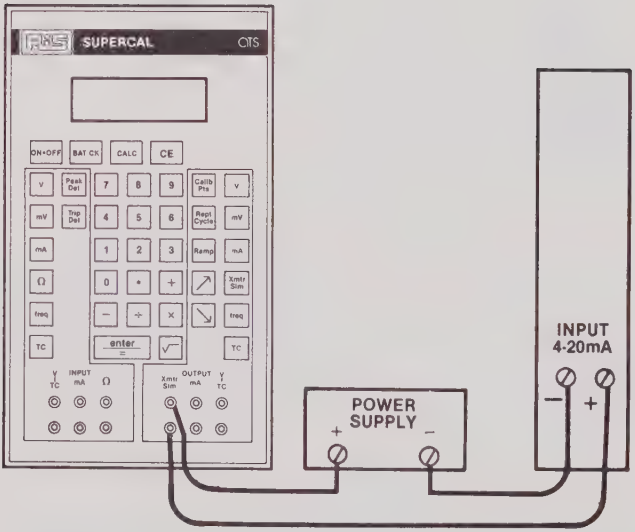



**Figure 1** Typical 2-Wire Simulator Connection

## TO USE RTD SIMULATOR AND CALIBRATING 3-WIRE RTD TRANSMITTERS

Using the RTD Simulator in conjunction with the SUPERCAL allows the operator to calibrate a RTD transmitter. By plugging the simulator into the Ohms Input of the calibrator, the operator is able to use the Ohms input function to first calibrate the simulator to the "Zero" and the "Span" (maximum value) of the RTD resistance and then, with the flip of a switch, transmit the zero and maximum value resistances to the RTD Transmitter input.

The following steps describe the procedure to calibrate the RTD Simulator and to calibrate a RTD Transmitter:

Refer to Figure 2A for the connections to the calibrator and RTD Simulator.

1. Turn on the CL-6000 SUPERCAL. Wait for the "battery save" prompt; then press [0].

2. Press [Ω] and insert the CL6030 RTD Simulator into the Ohms jacks on the "Input" side of the front panel. Note that there are four connectors on the rear of the RTD simulator: The vertical set on the left are the active connectors and must be inserted into the Ohms Input terminals, while the vertical set on the right are used only to help support the simulator and should mate with the Millamp Output Terminals.

3. Position the top toggle switch on the RTD Simulator to "Measure" and the bottom toggle switch to "Zero".

4. Adjust the Zero Fine Potentiometer and the Zero Coarse Potentiometer counterclockwise maximum. The display of the calibrator should read less than 1 Ohm.

5. While observing the display of the calibrator, adjust the Coarse Potentiometer with a screw driver until the display reads a small amount less than the value of the "Zero" of the RTD. Adjust the Fine Potentiometer until the display reads the exact value of the "Zero" of the RTD.

6. Position the bottom toggle switch of the simulator to "Span".

7. Adjust the Span Fine Potentiometer and the Span Coarse Potentiometer counterclockwise maximum. The display of the calibrator should read less than 1 Ohm.

8. While observing the display of the calibrator, adjust the Span Coarse Potentiometer until the display reads a small amount less than the maximum value of the RTD. Adjust the Span Fine Potentiometer until the display reads the exact value of the maximum value of the RTD.

9. Position the top toggle switch to "Output" and the RTD Simulator is ready for calibrating. Note: The display should read less than 1 Ohm.

10. Connect the unit to be calibrated to the RTD Simulator as shown in Figure 2B. Note that the output of the RTD Transmitter may be connected to either the Milliamp or Voltage Input Terminals of the SUPERCAL. Press the appropriate Input Selection Switch on the calibrator to read the output of the RTD Transmitter to be calibrated.

11. Position the bottom toggle switch to "Zero" and while observing the display, adjust the RTD Transmitter for the Zero output value of the transmitter.

12. Position the bottom toggle switch to "Span" and while observing the display, adjust the RTD Transmitter to the maximum output of the transmitter.

13. Repeat steps 10 and 11 until the desired accuracy of the RTD Transmitter is received.

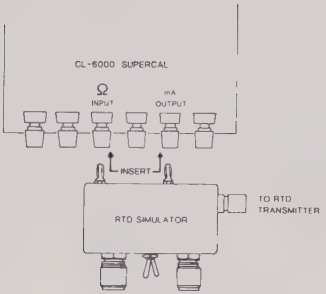



**Figure 2A**

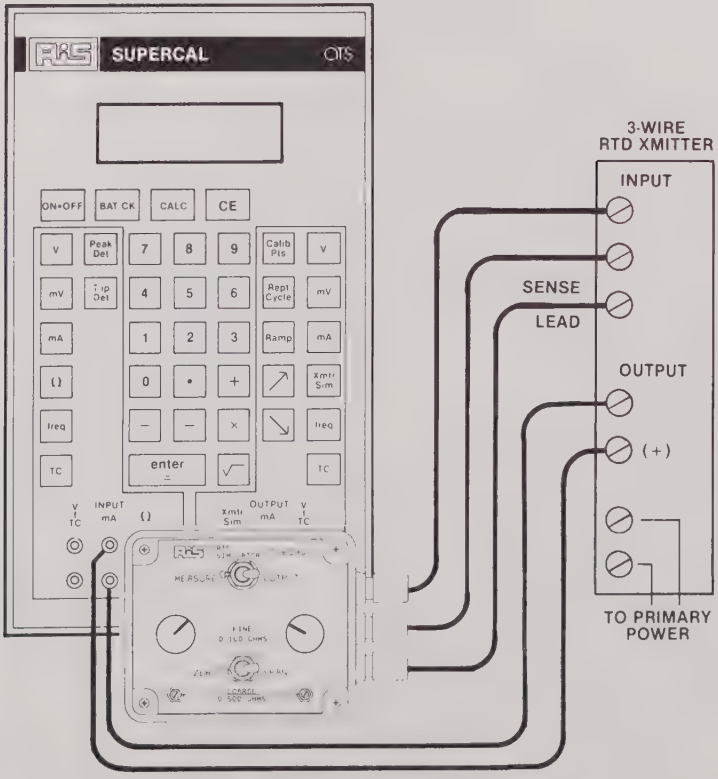



**Figure 2B**

## CALIBRATION OF mV TO CURRENT CONVERTERS

This example assumes a 10 to 50mV input and a 4 to 20 mA output.

(1) connect as shown (Fig. 3)

(2) Select **mV** output.

(3) Select **mA** input.

(4) Select calibration points. **Calib Pts**

(5) Enter 10mV. (PT #1)

(6) Enter 50mV. (PT #2)

(7) Press ↗ and adjust converter "zero" to 4.00 mA.

(8) Press ↗ and adjust converter span to 20.00 mA.

(9) Repeat steps (7) and (8) until readings are within desired tolerance.

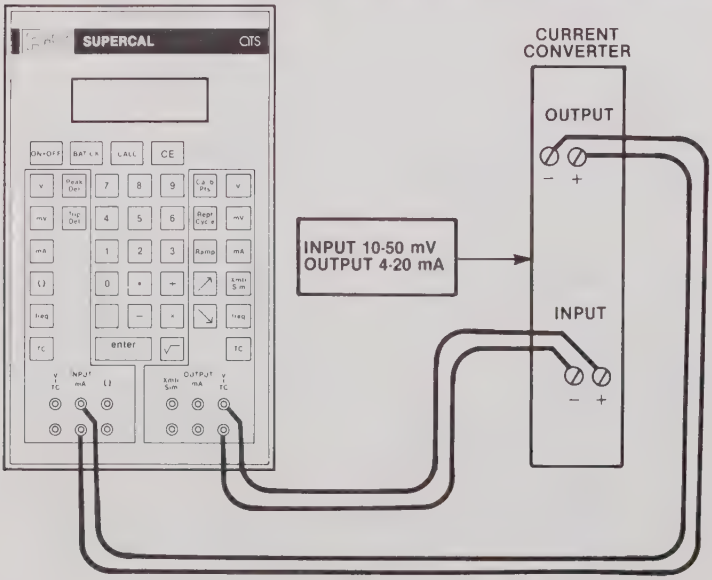



**Figure 3** Typical Converter Connection

## CALIBRATION OF MILLIVOLT ALARMS

(1) Connect as shown (Fig. 4) The Input Ohms can be connected to either the "normally-open" or "normally-closed" contacts of the unit under test. When connected to the "normally-open" contacts, the display will include the word, Overrange; when connected to the "normally-closed" contacts, the display will include "0 ohms". There are to be no sources connected to the contacts.

(2) Select [mV] output.

(3) Select [Ω] input and then press [Trip Det]

(4) Enter the millivolt trip output voltage.

(5) While adjusting the tripset potentiometer observe the display of the SUPERCAL. When the word "TRIP" appears in the display, discontinue adjusting the potentiometer.

(6) To dynamically check the accuracy of the calibrated unit, reset the trip function by depressing [Trip Det].

(7) Press [mV] output and then press [Ramp]. When the "trip" is detected, the display will indicate the output value that caused the "trip".

## CALIBRATION OF MILLIVOLT ALARMS (Continued)

(8) The SUPERCAL will now request the low limit, the high limit and the ramp time interval; enter these values. At this time there are three choices:

A. Ramp from Low limit to High limit and hold at the High limit by pressing [↗].

B. Ramp from High limit to Low limit and hold at the Low limit by pressing [↘].

C. Continuously Ramp from Low limit to High limit with a 10-second hold at maximums and minimums by pressing [Rept Cycle].

**Note**

Once the SUPERCAL has detected a "trip" it is necessary to manual reset the unit by pressing [Trip Det] in order for the unit to recognize another "trip".

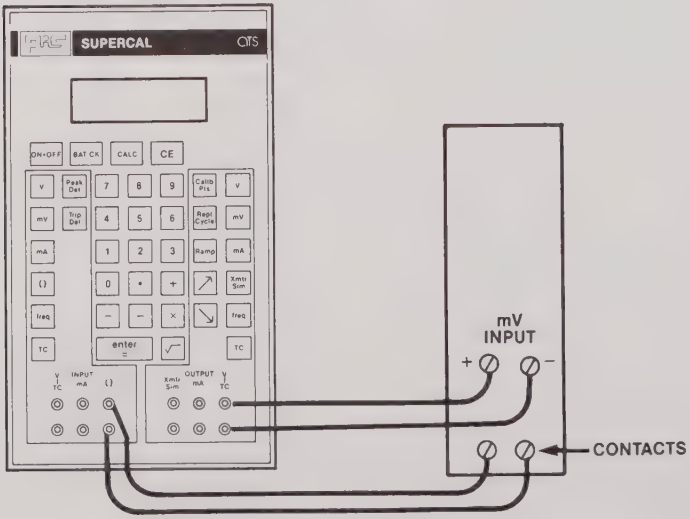



**Figure 4** Typical Millivolt Alarm Connection

## CALIBRATION OF SQUARE ROOT EXTRACTORS

(1) Connect SUPERCAL as shown (Fig. 5)

(2) Select [V] input.

(3) Select [V] output.

(4) Select [Calib Pts] .

(5) Enter points as follows:

Pt. #1 1V
Pt. #2 1.25
Pt. #3 2V
Pt. #4 3V
Pt. #5 4V
Pt. #6 5V

(6) Press [↗]. The SUPERCAL will output 1.000 volts.

(7) Adjust low voltage cut-off for 1.000 ± 0.01V.

(8) Press [↗]. The SUPERCAL will output 1.250V.

(9) Adjust zero pot. for 2.000V ± 0.01V.

(10) Press [↘] and verify low voltage cut-off is still 1.000V.

(11) Press [↘]. The SUPERCAL will output 5.000V.

(12) Adjust the gain or span pot. for 5.000 volts.

## CALIBRATION OF SQUARE ROOT EXTRACTORS (Continued)

(13) Press **Rept Cycle** and check results as follows:

| Calibrator Input (Extractor Output) | Calibrator Output |
|---|---|
| 1.000 ± 0.01V | 1.000V |
| 2.000 ± 0.01V | 1.250V |
| 3.000 ± 0.01V | 2.000V |
| 3.828 ± 0.01V | 3.000V |
| 4.464 ± 0.01V | 4.000V |
| 5.000 ± 0.01V | 5.000V |

(14) Readjust if required by pressing either ↗ or ↘ arrows. Repeat (6) through (13) as needed.

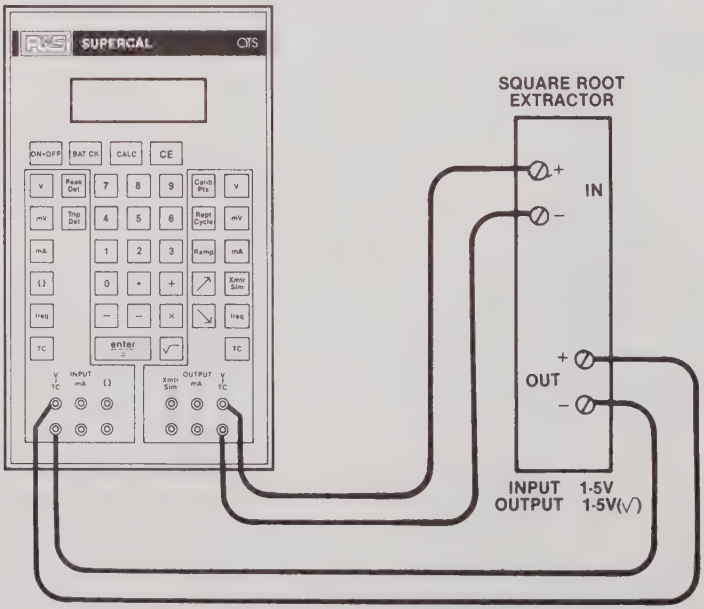



**Figure 5** Typical Square Root Extractor Connection

## CALIBRATION OF A PNEUMATIC TO CURRENT 2-WIRE CONVERTER WITH SUPERCAL 24 VDC POWER

The SUPERCAL is capable of supplying unregulated 24 Vdc into a 480 ohm load (supplying 50ma) from the mAMP positive terminal and the Xmtr Sim negative terminal. When using this supply, check that the unit under test does not require more than 50 mA of current. If this rating is exceeded, an internal fuse will blow. Caution: Wrong polarity connections of the 2-wire transmitter and the 24V supply may also cause the internal fuse to blow.

(1) Connect calibrator as shown (Fig. 6)

(2) Select **mA** input.

(3) Close valve.

(4) Adjust pressure source for 3 psi.

(5) Turn zero adjust screw to obtain 4.00mA.

(6) Adjust pressure source for 15 psi.

(7) Turn span adjust screw to obtain 20.00mA.

(8) Repeat steps (4) through (7) until outputs are correct without adjustment.

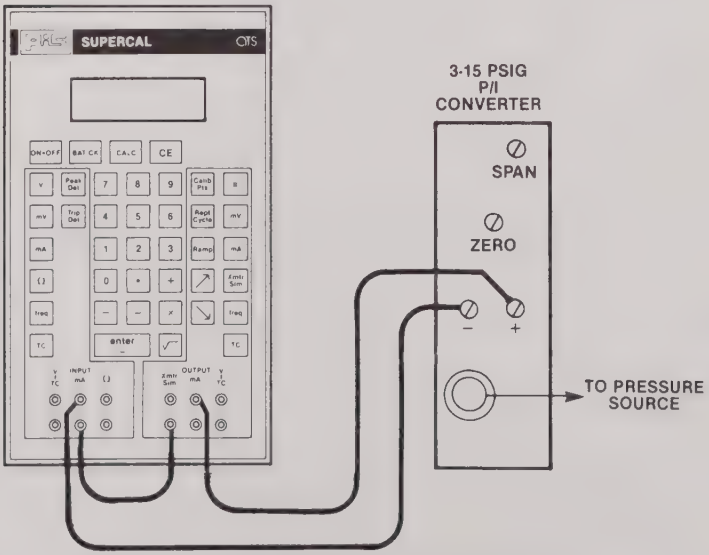



**Figure 6** Typical Converter Connection using SUPERCAL 24 VDC Power

## TO CALIBRATE ISOLATED THERMOCOUPLE 2-WIRE TRANSMITTERS

The SUPERCAL is capable of supplying unregulated 24 Vdc into a 480 ohm load (supplying 50ma) from the mAMP positive terminal and the Xmtr Sim negative terminal. When using this supply, check that the unit under test does not require more than 50 mA of current. If this rating is exceeded, an internal fuse will blow. Caution: Wrong polarity connections of the 2-wire transmitter and the 24V supply may also cause the internal fuse to blow.

(1) Connect the SUPERCAL as shown (Fig. 7). Use T/C wire of the type being simulated for the input.

(2) Select mA input.

(3) Then select TC output key.

(4) Enter the thermocouple type.

(5) Select the appropriate temperature units.

(6) Enter the "zero" temperature.

(7) The SUPERCAL will now simulate the millivolt output of the selected thermocouple at the "zero" temperature.

(8) While observing the milliamp input current in the left hand side of the display, adjust the unit under test for the desired output "zero".

(9) Enter the maximum thermocouple temperature.

(10) The SUPERCAL will now simulate the millivolt output of the selected thermocouple at the maximum temperature.

(11) While observing the milliamp input current in the left-hand side of the display, adjust the unit under test for the desired output maximum.

(12) Repeat steps 6 thru 11 until the desired accuracy is achieved.

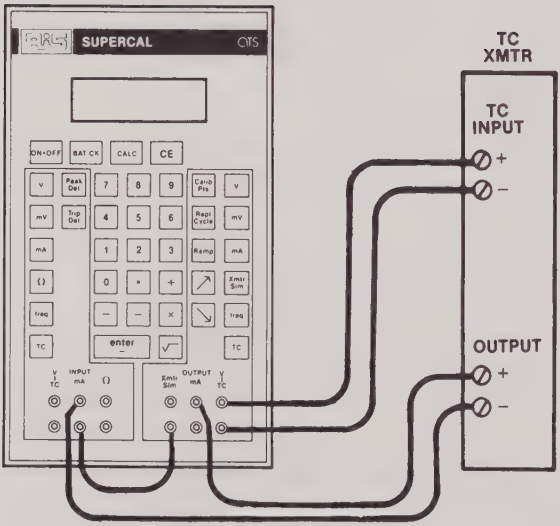



**Figure 7** Typical Connection for Isolated Thermocouple 2-Wire Transmitters

## MAINTENANCE

The CL-6000 SUPERCAL has been designed to require a minimum of maintenance and therefore requires no adjustments by the user to ensure its accuracy. However, as with any precision instrument, it is recommended that the customer return the unit to RiS on an annual maintenance schedule to guarantee its accuracy.

Should it become necessary to send the unit back to RiS for repair or maintenance, follow the procedure described in the Procedures for Factory Repair And Return Sheet located at the end of the manual.

## FUSE REPLACEMENT

Should it become necessary to change a fuse in the CL-6000, take the following steps:

1. Turn the unit off and disconnect the battery charger from the unit.

2. Take the SUPERCAL from its carrying case. Remove the four rear screws and slide the backplate out to expose the fuses as indicated in Figure 8.

3. Determine the blown fuse from the table below and extract the fuse using a screwdriver or pair of pliers.

| FUSE | FUNCTION |
|---|---|
| F1 (+) | Mamps input |
| F2 (+) & F3 (−) | Ohms input |
| F4 (−) & F5 (+) | Mamps output |
| F6 (+) | V/mV/Freq. |

4. Replace the blown fuse with a new one from the supply of spare fuses located in the rear pocket of the carrying case. Note: All mini fuses have the same rating. Slide the backplate into place and secure it with the four screws.

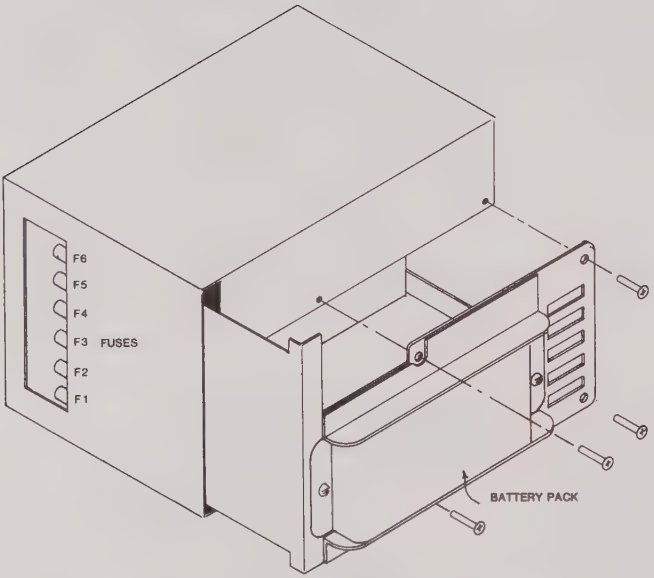



**Figure 8** Fuse and Battery Pack Location

## BATTERY REPLACEMENT

The inability to charge the batteries to their proper voltage may mean that the batteries are worn out and need replacement. To change the battery pack in the SUPERCAL refer to Figure 8 and the following procedure:

1. Remove the two screws that secure the battery pack cover to the unit.

2. Disconnect the battery pack connector from the PC board.

3. Connect the new battery pack to the PC board.

4. Secure the battery pack to the unit with the two screws.

Since the battery packs are shipped in an uncharged state, it is necessary to charge them for 14 to 16 hours before portable operation of the unit may be resumed. However, bench operation with battery charger connected to the unit may be resumed immediately

## RiS SUPERCAL Specifications

| INPUTS | | RANGE | RESOLUTION | ACCURACY [B] |
|---|---|---|---|---|
| Volts [A] | : | 0-2Vdc | 0.1mV | ± 0.025% |
| | | 2.10Vdc | 1 mV | ± 0.025% |
| mV | : | 0-200 mVdc | 10uV | ± 0.05% |
| mA | : | 0-200 mAdc | 10 uA | ± 0.05% |
| Ohms [A] | : | 0-99.9 Ohms | .01 Ohms | ± 0.06% |
| | | 100-1.999K Ohms | 0.1 Ohms | ± 0.05% |
| | | 2K-5K Ohms | 1.0 Ohms | ± 0.05% |
| Frequency [A] | : | 10 HZ - 1 KHZ | 0.1 HZ | ± 0.025% |
| | | 1 KHZ - 20 KHZ | 1.0 HZ | ± 0.025% |
| | | 20 KHZ - 50 KHZ | 10 HZ | ± 0.025% |
| | | Amplitude 100mV to 130 V Pk. to Pk. | | |
| Thermocouples : | | | | |
| Type J | | – 200°C to 1000°C | 0.1° | |
| | | – 300°F to 1830°F | | |
| Type K | | – 155°C to 1370°C | 0.1° | ± 1°F Typical |
| | | – 250°F to 2500°F | | ± 2°F Max. |
| Type T | | – 170°C to 400°C | 0.1° | (less than-240°F |
| | | – 270°F to 750°F | | ± 4° Max) |
| Type E | | – 200°C to 1000°C | 0.1° | |
| | | – 330°F to 1830°F | | |

| OUTPUTS | | RANGE | DRIVE CAPABILITY | RESOLUTION | ACCURACY [B] |
|---|---|---|---|---|---|
| Volts | : | 0 - 10Vdc | 2K Ohms | 1 mV | ± 0.025% |
| mV | : | 0-200 mVdc | 2K Ohms | 10 uV | ± 0.05% |
| mA | : | 0-55 mAdc | 400 Ohms | 10 uA | ± 0.025% |
| Frequency | : | 50HZ-1KHZ | 10V P-P | 0.1 HZ | ± 0.025% |
| | | 1KHZ-20KHZ | 2K Ohm | 1 HZ | ± 0.025% |

Thermocouples :

| | | | | |
|---|---|---|---|---|
| Type J | – 200°C to 1000°C<br>– 300°F to 1830°F | 2K Ohm | 0.1° | |
| Type K | – 155°C to 1370°C<br>– 250°F to 2500°F | 2K Ohm | 0.1° | ± 1°F Typical<br>± 2°F Max. |
| Type T | – 170°C to 400°C<br>– 270°F to 750°F | 2K Ohm | 0.1° | (less than-240°F<br>± 4° Max) |
| Type E | – 200°C to 1000°C<br>– 330°F to 1830°F | 2K Ohm | 0.1° | |

*T/C Wire must be used from output of calibrator to unit under test.

Note A Autoranging.
Note B Accuracy Stated as a percent of span and at 25°C.
Accuracy traceable to NBS.

OTHER OPERATIONAL SPECIFICATIONS

| | | | |
|---|---|---|---|
| Excitation Current | : | Ohms Function | 1 mA ±5% |
| Imput Impedance, Measuring | : | Volts | 10 Megohms |
| | | Millivolts | 10 Megohms |
| | | T/C | 10 Meghoms |
| | | Current | 10 Ohms Nominal |
| | | Frequency | 1 Megohm ±10% |
| Output Impedance For | : | Volts | 10 Ohms Nominal |
| | | Millivolts | 10 Ohms Nominal |
| | | Current | 1 Megohm |
| | | Frequency | 10 Ohms Nominal |

Output Loop Drive : (4-20ma) max. external loop resistance 1150 Ohms
(10-50ma) max. external loop resistance 300 Ohms

2-Wire Simulator : Max. external loop voltage 80VDC
Max. external loop resistance 1150 Ohms at 28V loop power supply at 4-20mA output.

Slope-Ramp Output : Minimum 6 sec/span ±10% 1 step/second
Maximum 600 sec/span ±10% 1 step/second

Common Mode Rejection : 80 db at 60HZ
Normal Mode Rejection : 40 db at 60HZ

GENERAL ACCURACY SPECIFICATIONS

| | | |
|---|---|---|
| Linearity | : | Maximum error at 25°C ± .005% of span (except T/C) |
| Repeatability | : | Maximum error at 25°C ± .005% of span |

| | | |
|---|---|---|
| Ambient Tempertaure Effect Over Temperature Range | : | ± .00052% /°C |
| Long-Term Stability/Drift | : | ± .00025% /1000 Hr, non-accumulative |

INPUT/OUTPUT PROTECTION

| | | |
|---|---|---|
| V, mV, T/C, F Inputs Resistor and Zener Diode Protection | : | 130VAC, 140VDC, either polarity |
| Ohms, mA Input Fuse and Zener Diode Protection | : | 130VAC, 140VDC, either polarity |
| All Outputs, Fuse and Zener Diode Protected | : | ± 80VDC |
| Output Short Circuit Protection | : | Continuous without damage |
| Input to output Isolation | : | 300 VDC, 50 Megohms |
| Input and Output To Power | : | 300 VAC |

Fuses are plug-in type and easily accessible from bottom of unit.

ENVIRONMENTAL

| | | | |
|---|---|---|---|
| Temperature | : | Operational<br>Storage (With Batteries) | 0°C to 50°C<br>– 20°C to 60°C |
| Humidity | : | Operational | 95% at 45°C<br>non-condensing |

MECHANICAL

| | | |
|---|---|---|
| Dimensions | : | 9½"H x 5½"W x 5½"D<br>(241.3mm H x 139.7mm W x 139.7mm D) |
| Weight | : | 8½ Pounds (3.9Kg) |
| Carrying Case | : | Water repellent nylon with test leads, instruction book and spare fuses. |

OPERATING/CHARGE TIME

| | | |
|---|---|---|
| Battery Charge Time | : | 12-14 hours with external charger |
| Charging Power | : | 117V (optionally 220V), ± 10%, 50/60HZ, 20VA max. |
| Unit ON Time | : | 4-4½ hours at 20 mA DC out.<br>4½-5 hours at 0 mA out. |

Specifications subject to change without notice.

## PROCEDURES FOR FACTORY REPAIR AND RETURN

A. Prepare a Returned Material Authorization Form (available from RiS or its local Representative) with the following information.

1. Model and Serial Number of the Equipment
2. The failure symptom - BE SPECIFIC
3. The operating environment, i.e., Indoor/Outdoor, approximate temperature, vibration, dusty conditions, etc.
4. Approximate date of installation or number of operating hours.
5. The site name and address of the failed equipment.
6. Complete shipping information for the return of the equipment if other than the operating site.
7. Name of person, and telephone number to contact if questions arise.

B. Enclose above information with the device and pack the equipment in a commercially accepted container with sufficient packing material to insure that no shipping damage will occur.

Ship the Equipment to appropriate location:

Attention: REPAIR DEPARTMENT

ROCHESTER INSTRUMENT SYSTEMS, INC.
255 North Union Street
Rochester, New York 14605
(716)263-7700 Telex: 978457 Cable: RISROCNY

ROCHESTER INSTRUMENT SYSTEMS, LTD.
Maxim Road
Crayford, Kent
DA1 4BG, United Kingdom
Telephone: Crayford 526211
Telex 27831 Telegrams: RiSCom Dartford

ROCHESTER INSTRUMENT SYSTEMS, LTD.
915 Kipling Avenue
Toronto M8Z 5H4 Canada
(416) 233-6218 Telex: 06 967801

IN THE MIDDLE EAST:
For skilled on site servicing and commissioning contact our factory trained technicians at:

SISCO
Saudi Industrial and Technical Services Co.
P.O. Box 319
DHARAN AIRPORT
SAUDI ARABIA
Telephone: 895-5031. Telex: 671311 SIS SJ

C. Your equipment will be tested, repaired and inspected at the factory. Normal factory turnaround in ten days or less (excluding shipping time).

D. For emergency service or repair status information please contact appropriate RiS Instrument Customer Service Department or your local RiS Representative.

## NOTES

## NOTES